

**REMARKS**

The Office Action of March 18, 2003 has been received and its contents carefully considered.

The Examiner has indicated that the present application contains allowable subject matter.

The Examiner has raised a number of problems with respect to the definiteness of the claims. The Examiner has also rejected the claims based on prior art. Applicants discuss below each of these points raised by the Examiner.

Claims 5-7 and 10-17 have been rejected under the first paragraph of 35 U.S.C. § 112, as containing subject matter that was not described in the specification in such a way as to reasonably convey to one of ordinary skill in the art that the inventors had possession of the claimed invention at the time the application was filed.

The Examiner sets forth a number of reasons for this rejection. Applicants discuss each reason below.

(a) The Examiner states that the original disclosure does not provide support for a light-emitting material represented by formula (7), wherein  $Z^{22}$  represents a non-metallic atom group required to form an imidazole ring, a thiazole ring, an oxazole ring, a pyrrole ring, a pyridine ring or a pyrimidine ring. The Examiner states that these rings are inconsistent with formula (7) in which  $Z^{22}$  forms a ring with two nitrogens, the two nitrogens being at positions 1 and 2 of the ring. The Examiner states that page 27 of the specification discloses these rings for the rings formed by  $Z^{21}$ , but not for  $Z^{22}$ .

In response, applicants have amended the definition of  $Z^{22}$  in formula (7) of claim 5 to state that  $Z^{22}$  can be a 1,2,3-triazole ring, a 1,2,4-triazole ring or a pyridazine ring, as disclosed at page 27, lines 21 to 33 of the specification.

(b) The Examiner states that in formula (20), as defined in claim 5, it is not clear where support exists for the definitions of m203 and n203. The Examiner states that based on the definitions of m203 and n203 in claim 5, formula (20) encompasses iridium complexes consisting of iridium and as few as one bidentate ligand or as many as five bidentate ligands.

Formula (20) in claim 5 states that m203 represents an integer of from 1 to 3 and n203 represents an integer of from 0 to 2.

In response, applicants have amended formula (20) in claim 5 to state that m203 and n203 represent the number of ligands required to satisfy a coordination number 6 of iridium.

Examples of compounds that fall within the definition of original formula (20) of claim 5 are compounds (1-53), (1-55), (1-56), (1-57), (1-59) and (1-60) at pages 46 to 48 of the specification. In Compound (1-59), n203 is 1, and n203 is 2.

In Compounds (1-53), (1-55), (1-56) and (1-58), m203 is 2, and n203 is 1. In Compound (1-60), m203 is 3, and n is 0. Applicants submit that one of ordinary skill in the art would clearly understand that in formula (20), the definitions of m203 and n203 satisfy the coordination number 6 of Ir, and applicants have amended formula (20) to so state.

Applicants note that in claim 5, applicants have further amended formula (20) to state that  $L^{203}$  is a nitrogen-containing heterocyclic ligand to coordinate Ir metal as a bidentate ligand. Compound (1-56) at page 47 of the specification provides support for this amendment.

(c) The Examiner states that support for the definitions of m202 and n202 as set forth in formula (19) of claim 15 is not clear. The Examiner states that based on the definitions of m202 and n202 in claim 15, formula (19) encompasses iridium complexes consisting of iridium and as few as one bidentate ligand or as many as seven bidentate ligands.

In response, applicants have amended claim 15 to state that n202 and n203 represent the number of ligands required to satisfy the 6 coordination number of iridium.

For example, if  $L^{202}$  is a monodentate ligand, when m202 is 1, n202 is 4 to satisfy the 6 coordination number of iridium, and when m202 is 2, n202 is 2, and when m202 is 3, n202 is 0. As a further example, if  $L^{202}$  is a bidentate ligand, when m202 is 1, n202 is 2 to satisfy the 6 coordination number of iridium, and when m202 is 2, n202 is 1, and when m202 is 3, n202 is 1. Applicants submit that one of ordinary skill in the art would readily understand the definitions of m202 and n202 from the disclosure of the present specification.

In view of the above, applicants submit that claims 5 to 7 and 10 to 17 comply with the requirements of the second paragraph of 35 U.S.C. § 112 with respect to the above points and, accordingly, request withdrawal of this rejection.

Claims 5-7 and 10-17 have been rejected under the second paragraph of 35 U.S.C. § 112, as indefinite. The Examiner sets forth a number of reasons for this rejection. Applicants discuss each reason below.

(a) The Examiner states that in claim 5, lines 6-7 define variables not found in any of formula (4) to (9) or (20) to (22).

In response, applicants have deleted lines 6 and 7 from claim 5.

(b) The Examiner states the scope of the light emitting materials having a partial structure represented by formula (5) or (6) is not clear.

With respect to formula (5), the Examiner states that it is not clear if "CO" requires a carbonyl group, or if "CO" encompasses any group containing a carbon attached to an oxygen. The Examiner further states that it is not clear if there is any limitation as to how "CO" is joined to "Ir" in formula (5). The Examiner asks, for example, whether "CO" can be part of a substituent on a ligand joined to the iridium.

Formula (5) covers compounds such as (1-29), (1-33), (1-34), (1-35) and (1-40) at pages 42 to 40 of the specification.

Thus, the "CO" represents a carbonyl group, and is directly joined to Ir. Applicants have amended formula (5) in claim 5 to so state.

With respect to formula (6), the Examiner states that it is not clear if "NC" requires a cyano group, or if "NC" encompasses any group containing a nitrogen attached to a carbon. The Examiner further states that it is not clear if there is any limitation as to how "NC" is joined to "Ir" in formula (6). The Examiner asks, for example, whether "NC" can be part of the substituent on a ligand joined to the iridium.

Formula (6) covers compounds such as Compounds (1-38) and (1-39) at page 44 of the specification, where "CN" represents a cyano group and is directly joined to Ir. Applicants have amended formula (6) in claim 5 to so state.

(c) The Examiner states that the scope of the light emitting materials having a partial structure represented by formula (7) is not clear because the definition of  $Z^{22}$  in claims 5 and 10 is inconsistent with the formula.

In response, and as discussed above, applicants have amended the definition of  $Z^{22}$  in formula (7) of claim 5 to state that  $Z^{22}$  can be a 1,2,3-triazole ring, a 1,2,4-triazole ring or a pyridazine ring. In addition, applicants have amended claim 10 to change  $Z^{22}$  to  $--Z^{21}--$ .

(d) The Examiner states that the scope of the compound represented by formula (7) is not clear because it is not clear if  $Z^{21}$  must form a ring containing at least one carbon atom other than the carbon atom shown in the formula and containing at least one nitrogen atom.

Applicants disagree with the Examiner.

$Z^{21}$  is present in a ring which contains  $Y^2$  and C.  $Y^2$  represents a nitrogen atom or a carbon atom. Thus,  $Z^{21}$  represents a nonmetallic atom group required to form a 5 or 6-membered ring, which ring contains one carbon atom and at least one of a carbon atom and nitrogen atom. There is no requirement in formula (7) that the ring in which  $Z^{21}$  appears must contain a nitrogen atom. Similarly, there is no requirement in formula (7) that the ring in which  $Z^{21}$  appears must contain at least one carbon atom in addition to the carbon atom shown in the formula.

In any event, in Paragraph 11 of the Office Action, the Examiner has proposed phraseology which omits the term "with at least one of carbon atom and nitrogen atom" in the

definition of Z<sup>21</sup>. Accordingly, applicants have deleted the term “with at least one of carbon atom and nitrogen atom” from formula (7).

(e) The Examiner states that in claim 14, there is no antecedent basis for L<sup>202</sup> of formula (20). The Examiner states that L<sup>202</sup> should apparently read --L<sup>203</sup>--.

In response, applicants have amended claim 14 in the manner proposed by the Examiner to recite “L<sup>203</sup>”.

(f) The Examiner states that claim 15 is confusing when it states that “formula (9) is represented by formula (19)”. The Examiner suggests that it would be more accurate to recite “wherein a material represented by formula (9) is further represented by formula (19)”.

Applicants submit that the wording in claim 15 is not confusing, and that one of ordinary skill in the art would understand the meaning of claim 15.

In any event, applicants have amended claim 15 to place it in independent form and to no longer refer to formula (9).

In view of the above, applicants submit that claims 5 to 7 and 10 to 17 comply with the requirements of the second paragraph of 35 U.S.C. § 112 with respect to the above points and, accordingly, request withdrawal of this rejection.

Claims 5-7 and 10-17 have been rejected under 35 U.S.C. § 102 (b) as anticipated by a newly cited patent publication U.S. 2002/012638 to Grushin et al.

Applicants submit that Grushin et al do not defeat the patentability of the subject matter of the present claims and, accordingly, request withdrawal of this rejection.

The Examiner asserts that Grushin et al disclose compounds that satisfy formula (8), formula (21), formula (5) and formula (6) of the present claims.

Compound 1-m of Grushin et al is a pyrimidine compound that satisfies formula (8). Compound 1-m of Grushin et al is a compound that is within the scope of the "Fourth Formula" of Grushin et al which is "fac-Ir(L<sup>a</sup>)<sub>3</sub>, where L<sup>a</sup> has the structure (I) of Grushin et al.

Formula (8) has been deleted from claim 5 and a new independent claim 24 has been added which contains formula (8).

Applicants enclose herewith a translation of applicants' Japanese priority application, P. Hei 11-370349JP, filed in Japan on December 27, 1999, which is before the earliest possible date that Grushin et al may be used as a reference.

The priority application of the present invention, P. Hei 11-370349JP, filed 12/27/1999, suggests the general structure of compound 1-m, which is within the scope of the "Fourth Formula" of Grushin et al. See paragraph [0015] of the enclosed translation of the priority document, which discloses at page 8, lines 3 to 5, that a ligand is exemplified as an aryl group-substituted nitrogen-containing heterocyclic derivative. The substitution position is disclosed as follows, at page 8, lines 5 to 7: "The aryl group substitutes for the nitrogen-containing heterocycle on the carbon atom adjacent to nitrogen atom". Examples of the nitrogen-containing heterocycle include pyrimidine or isoquinoline. See compound (1-12) at page 21 of the translation for a compound that is within the scope of formula (8).

In view of the above, applicants submit that they have gotten back of Grushin et al as a reference against formula (8) and, accordingly, request withdrawal of this rejection with respect to formula (8).

Formula (IV) of Grushin et al is a formula that is within the scope of formula (21) of the present application. Applicants have amended claim 5 to delete formula (21) and have added a new independent claim 23 that is directed to formula (21).

Applicants enclose herewith a translation of applicants' Japanese priority application P 2000-89274JP, filed in Japan on March 25, 2000, which is before the earliest possible date that Grushin et al may be used as a reference. Formula (1) of P 2000-89274JP corresponds to formula (21) of claim 23. Accordingly, applicants submit that Grushin et al cannot be used as a reference against claim 23 and, therefore, request withdrawal of this rejection with respect to formula (21).

With respect to formulas (5) and (6) of the present claims, the Examiner's position is based upon his interpretation that these claims should be interpreted broadly to encompass any iridium compound having a group comprising a carbon attached to an oxygen (formula (5)), or a nitrogen attached to a carbon (formula (6)).

However, as discussed above, formulas (5) and (6) require a carbonyl group or a cyano group, respectively, directly attached to the iridium, and applicants have amended formulas (5) and (6) to so state. Accordingly, applicants submit that Grushin et al do not disclose formula (5) or (6).

In view of the above, applicants request withdrawal of this rejection.



Claim 5-7 and 10-17 have been rejected under 35 U.S.C. § 102(e) as anticipated by the Thompson et al U.S. patent publication 2002/0034656.

The Examiner especially relies on Figures 17, 18, 24, 26, 35 and 36 of Thompson et al.

This rejection is based on the Examiner's broad interpretation of the meaning of formula (5) and (6). As discussed above, formulas (5) and (6) require a carbonyl group and a cyano group attached directly to the Ir, and applicants have amended the claims to so state.

In view of the above, applicants request withdrawal of this rejection.

Claims 5-7 and 10-17 have been provisionally rejected under 35 U.S.C. § 102(e) as anticipated by copending Appln. No. 09/695,978.

The Examiner relies on compound (f) of the copending application to satisfy formula (21). In addition, the Examiner asserts that compound (f) satisfies formulas (5) and (6) based on the Examiner's broad interpretation of the meaning of formulas (5) and (6).

As discussed above, applicants have amended the claims so that formula (21) now appears in new independent claim 23. Further, applicants have enclosed a translation of applicants' Japanese priority application P 2000-89274JP, filed in Japan on March 28, 2000, which fully supports claim 23. The March 28, 2000 filing date is before the October 26, 2000 filing date of copending application 09/695,978.

Accordingly, applicants submit that the copending application cannot be used as a reference against formula (21) and claim 23 of the present application.

With respect formulas (5) and (6), and as discussed above, applicants have amended formulas (5) and (6) to state that formulas (5) and (6) require a carbonyl group or a cyano group,

respectively, directly attached to the iridium. Accordingly, applicants submit that the copending application does not disclose formula (5) or (6).

In view of the above, applicants request withdrawal of the rejection based on the copending application.

Claims 5-7 and 10-17 have been rejected under 35 U.S.C. § 103(a) as obvious over Thompson et al '656 or Grushin et al '638.

In the Office Action, the Examiner asserts that although Thompson et al do not disclose a specific example of an iridium complex satisfying the recitations of formula (20), such a complex is suggested by paragraph [0052] and Figure 49 of Thompson et al. The Examiner argues that the acrylquinoline disclosed in Figure 49 of Thompson et al provide iridium complexes represented by formula (20), wherein  $m$  is 1 to 3.

In response, as discussed above, applicants have amended formula (20) in claim 5 to state that  $L^{203}$  is a nitrogen-containing heterocyclic ligand. Thompson et al do not disclose or suggest compounds of formula (20) having a nitrogen-containing heterocyclic ligand.

As shown in paragraph [0109] and Figure 49 of Thompson et al, Thompson et al teach acrylquinoline as a ligand (L) of  $L^2MX$ , and also teach X is a monoanionic bidentate ligand. There is no disclosure or suggestion of a specific complex molecule having a combination of acrylquinoline and a nitrogen-containing heterocyclic ligand. Applicants submit that it is not obvious for one of ordinary skill in the art to pick and choose the particular combination to arrive at complex compounds within the scope of the subject matter of formula (20) in claim 5.

The Examiner also asserts that Thomson et al disclose position isomers of acrylquinolines of an iridium complex meeting the recitations of formulas (9) and (21), and represented by formula (19) of claim 15. Thompson et al, however, do not disclose or suggest position isomers of acrylquinolines that are within the scope of formulas (9) and (21).

Therefore, Thompson et al fail to teach or suggest the present invention.

With respect to the Examiner's assertion that the position isomers in Thompson et al are sufficient to render obvious formula (9), (21), or (19), applicants point out that the Examiner does not provide any reason as to why one of ordinary skill in the art would have been led to the position isomers of formulas (9), (19) or (21) from the teachings of Thompson et al, and why one of ordinary skill in the art would have expected that these position isomers would have the same properties as those set forth in the present claims.

Applicants enclose a copy of an executed Declaration under 37 C.F.R. § 1.131. The specific compounds of the present invention, as can be seen from the Declaration, possess properties that are unexpected as compared to the compounds of Thompson et al. The Declaration shows that the compounds of Thompson et al do not render obvious the complex of position isomers of acrylquinolines.

In the Declaration:

Compound C is a comparative example based on a compound that corresponds to a compound where L of the compound described in Fig. 29 of Thompson et al is replaced by the acrylquinoline described in Fig. 49 of Thompson et al.

Compound D is a position isomer of Compound C and is an example of formula (9) disclosed in claim 5.

Compound G is a position isomer of Compound C and is an example of formula (21) disclosed in claim 21. (Applicants note that the Declaration states that Compound G corresponds to formulas (21) and (22), but Compound G is not within the scope of formula (22)).

Compound E is an example of formula (20) disclosed in claim 11.  
Compound F is an example of formula (20) disclosed in claims 13 and 14.

As can be seen from the Declaration, the Compound C according to Thompson et al does not achieve the results obtained by the position isomers Compound D (claim 9) and Compound G (claim 21).

This supports applicants' position that the position isomers are not obvious.

Further, with respect to formula (19), as discussed above, this formula now appears in independent claim 15. Although applicants have not presented a comparative example based on formula (19), the basic position of the Examiner that position isomers are obvious is disproved by the Declaration.

Accordingly, applicants submit that Thompson et al do not disclose or suggest the present claims.

Turning now to Grushin et al, the Examiner acknowledges that Grushin et al do not disclose a specific example of an iridium compound satisfying formulas (9) or (20) or (19), but argues that such complexes are clearly suggested by Grushin et al. The Examiner relies on paragraphs [0017] to [0021] of Grushin et al to suggest these formula.

Paragraphs [0017] to [0021] of Grushin et al disclose structure (I) of Grushin et al.

With respect to structure (I), applicants have enclosed a translation of applicants' Japanese priority application P Hei 11-370349JP, filed in Japan on December 27, 1999, which is the earliest date that Grushin et al can be used as a reference.

Structure (I) of Grushin et al corresponds to formula (3) of P. Hei 11-370349JP. See paragraph [0015] of the translation, where a ligand is exemplified as an aryl group-substituted nitrogen-containing derivative, at page 8, lines 4 to 5 of the translation, and the disclosure that "The aryl group substitutes for the nitrogen-containing heterocycle on the carbon atom adjacent to nitrogen atom," at page 8 lines 5 to 7 of the translation. Examples of the nitrogen-containing heterocycle include isoquinoline, as disclosed at page 8, line 11 of the translation. The translation also discloses that R<sup>1</sup> and R<sup>2</sup> of formula (3) may be connected to each other, or may be connected to each to form a condensed ring, as disclosed at page 15 of the translation. This disclosure is equivalent to the disclosure at page 23, lines 18 to 20 of the present specification. See also compound (1-8) at page 20 of the translation for a compound that is within the scope of formula (9).

Accordingly, applicants submit that they gotten back of Grushin et al as a reference against formulas (9), (19) and (20) with respect to structure (I) of Grushin et al.

Further, the Examiner has argued that an arylquinoline ligand according to present formulas (9), (19) or (20) is a position isomer of the ligand of formula (III) of Grushin et al.

As discussed above, applicants submit that position isomers are not obvious. The Examiner has not provided any reason as to why one of ordinary skill in the art would have been

led to the position isomers of formulas (9), (19) or (20) from the teachings of Grushin et al, and why one of ordinary skill in the art would have expected that these position isomers would have the same properties as those set forth in the present claims. The enclosed Declaration shows that the disclosure of one isomer does not suggest or render obvious a position isomer of an arylquinoline.

Still further, applicants point out that the ligand of formula (III) of Grushin et al corresponds to formula (1) of applicants' Japanese priority application P 2000-89274JP filed in Japan on March 28, 2000, which is before the earliest possible date that Grushin et al can be used as a reference. Accordingly, applicants submit that they have gotten back of Grushin et al as a reference against formulas (9), (19) and (20) with respect to position isomers and, therefore, request withdrawal of this aspect of the rejection.

In view of the above, applicants request withdrawal of this rejection.

The Examiner states that the present application contains allowable subject matter.

In particular, the Examiner states that formula (4), as defined in claim 5, is allowable over the art. Accordingly, applicant have added a new dependent claim 18 that is directed to formula (4).

The Examiner further states that formula (7) of claim 5 is allowable over the prior art when  $Z^1$  represents a nonmetallic group required to form a 5 or 6-membered ring, said ring optionally having a substituent for forming a condensed ring with another ring,  $Y^2$  represents a nitrogen atom or a carbon atom,  $b^2$  represents a single bond or double bond, and  $Z^{22}$  represents a nonmetallic atom group required to form a 1,2,3-triazole ring, a 1,2,4-triazole ring or a

pyridazine ring. Applicants have amended formula (7) in Claim 5 in the manner proposed by the Examiner. In addition, applicants have added a new dependent claim 19 directed to formula (7).

The Examiner also states that formula (9), as shown in claim 5, would be allowable if formula (9) were amended to delete the recitation that  $Z^{201}$  can represent an aryl ring. Accordingly, applicants have added a new dependent claim 20 directed to formula (9) in which  $Z^{201}$  is defined as representing an atomic group for forming a heteroaryl ring.

Further, the Examiner states that formula (10), as shown in original claim 5, would be allowable if formula (10) is amended to delete an aryl group from the definition of  $Z^{201}$ . Formula (10) was replaced by formula (20) in the Amendment Under 37 C.F.R. § 1.111 filed on December 26, 2002. Applicants have added a new independent claim 22, which is directed to formula (20) in which an aryl group is not recited in the definition of  $Z^{201}$ .

Finally, the Examiner states that formula (22) as defined in present claim 5 contains allowable subject matter. Accordingly, applicants have added a new dependent claim 21 that is directed to formula (22).

Applicants have also added new independent claims 25 and 26, directed to formulas (9) and (20), respectively. Applicants have discussed above why these formulas are patentable.

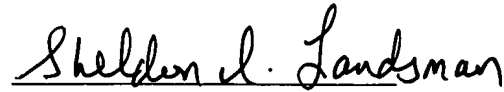
In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. 1.111  
Application No.: 09/747,933

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The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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CUSTOMER NUMBER

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